VII. Abstract

This report presents the results of a 24-month study of human response to two-hour exposures to freeway air in Southern California. A nine-passenger van was modified with a high-efficiency filtration system that delivered filtered or unfiltered air to an exposure chamber inside the van. State-of-the-art instruments were used to measure concentration and size distribution of fine and ultrafine particles and the concentration of other pollutants associated with motor vehicles. Nineteen volunteer subjects (average age 71 years) rode for two hours each in filtered and unfiltered air on two freeways, I-405 and I-710. Double-blind health assessments included 24-hour ambulatory ECG, blood biochemistry, blood pressure, and lung function. Mean unfiltered particle number concentration was 107,500 particles/cm^3 for I-710 and 77,800 particles/cm^3 for I-405; mean PM-2.5 mass was 51.4 and 44.5 $\mu g/m^3$ respectively. Filtration reduced particle count >95% but did not remove gases. Atrial ectopic beat incidence during and after exposure decreased 20% on average with filtered air compared to unfiltered air ($P<0.05$). Individual responses related most strongly to particle count ($P=0.01$). Blood markers NT pro-BNP and VEGF decreased 30% on average in filtered air compared to unfiltered air ($P<0.05$). This study documents a cardiac and vascular response associated with freeway travel.